UNITED STATES PATENT APPLICATION

Of

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For

Drum-type Washing Machine

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a drum-type washing machine, and more particularly, to a drum-type washing machine employing a lift having a curved portion and a concave recess.

Discussion of the Related Art

[0002] Generally speaking, laundering using a drum-type washing machine is carried out using a frictional force between the laundry and a rotating drum that receives the driving force of a motor. Such a method causes little damage to the laundry, prevents the laundry from getting tangled, and achieves such washing effects as beating and rubbing.

[0003] FIG. 1 illustrates a drum-type washing machine according to a related art, having a plurality of lifts 1 axially installed on the inner circumferential surface of a drum. An example of such a lift is shown in FIG. 2.

[0004] Referring to FIG. 1, a cylindrical drum 2 for holding and washing laundry is mounted within a tub 8 for holding washing water, such that the drum lies parallel with respect to a foundation. A rotational shaft 7 is connected to the drum 2 to rotate the drum forwardly and reversely, thereby enabling the laundry to be washed inside the drum. This rotating action results from a rotating force transferred to the drum 2 using an

electrical motion system made up of a motor 3 that drives a belt 5 linking a pair of pulleys 4 and 6, thus allowing full directional control of the rotation of the drum.

[0005] Each lift 1 has a regular trapezoidal cross-section, and when mounted on the drum 2, extends in parallel with the rotational shaft 7. In addition to the parallel configuration, each lift 1 has a pair of inclined sides 1a and 1b that are substantially planar.

[0006] In the operation of a drum-type washing machine constructed as above, laundry is placed in the drum 2, water is supplied to the tub 8, and the rotational shaft 7, driven by the motor 3, rotates the drum. As the drum 2 rotates, the laundry is lifted by at least one of the lifts 1, from a lower area of the drum's interior and up one side of the interior, until reaching a point where the inclined side 1a or 1b passes a plane level to the foundation, whereupon the lifted laundry falls back down to the drum's lower area. The laundry is thus washed by a combination of actions occurring in the washing water, including the drum's rotation and the laundry's lifting and falling. As the drum 2 rotates, the laundry is lifted and falls to produce a sudsing action in the washing water.

[0007] In the drum-type washing machine according to the related art, the configuration of the inclined sides 1a and 1b, i.e., the parallel orientation and planar side surfaces, provide

limited frictional force on the laundry. As a result, the lifting action is also limited, so that the laundry slides from the lift too soon, to fall only a short distance, which creates only a light sudsing action. Optimum washing, however, requires vigorous sudsing.

[0008] As above, the lifting ability of the lifts of the drum-type washing machine of the related art is insufficient. Therefore, the washing performance of the drum-type washing machine of the related art is less than optimum.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present invention is directed to a drum-type washing machine having a lift that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention is to provide a drum-type washing machine employing a lift having a curved portion and a concave recess, by which washing performance is improved, washing time is decreased, and a vibration and noise occurring during high-speed operation is reduced.

[0011] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows, and in part will become apparent to those having ordinary skill in the art upon examination of the following or

may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the specification and claims hereof as well as the appended drawings.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided a drum-type washing machine comprising: a drum for receiving laundry, the drum having an inner circumferential surface and being rotatable about a central axis; a rotational shaft coupled to the drum for transferring a rotational force to the drum; and a plurality of lifts mounted to the drum and installed at intervals around the inner circumferential surface, each lift having a predetermined length with respect to the central axis of the drum and having an overall curved configuration formed by a curved portion disposed toward the rotational shaft, the overall curved configuration consisting of an inner side and an outer side. The concave recess may be formed on one or both sides of the lift.

[0012] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0014] FIG. 1 is a schematic cross-sectional side view of a drum-type washing machine according to a related art;

[0015] FIG. 2 is a perspective view of a lift in FIG. 1;

[0016] FIG. 3 is a schematic cross-sectional side view of a drum-type washing machine having a plurality of lifts according to a first embodiment of the present invention;

[0017] FIG. 4 is a perspective view of one of the lifts shown in FIG. 3;

[0018] FIG. 5 is a schematic cross-sectional side view of another drum-type washing machine, wherein the lifts according to FIG. 4 are mounted in an alternative configuration; and

[0019] FIG. 6 is a perspective view of a lift according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are

illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0021] FIG. 3 illustrates a drum-type washing machine according to a first embodiment of the present invention, wherein a plurality of lifts are axially installed on an inner circumferential surface of a drum. An example of the lift is shown in FIG. 4.

[0022] Referring to FIG. 3, a drum 20 having a cylindrical shape for receiving and washing laundry is mounted within a tub 80 for holding washing water, such that the drum lies parallel with respect to a foundation. A rotational shaft 70 is connected to the drum 20 to rotate the drum forwardly and reversely, thereby enabling to wash the laundry inside the drum. This rotating action results from a rotating force transferred to the drum 20 using an electrical motion system made up of a motor 30 that drives a belt 50 linking a pair of pulleys 40 and 60, thus allowing full directional control of the rotation of the drum.

[0023] Referring to FIG. 4, each of the lifts 10 has an overall curved configuration formed by a curved portion disposed toward the rotational shaft 70 and a concave recess 10a for catching laundry formed in the entire length of the inner side of the curve. Each lift extends a predetermined length in the axial direction of the drum 20. The concave recess 10a is formed on

the inner side of the curved portion. During operation of the drum-type washing machine according to the present invention, laundry rotating with in the drum 20 will be caught in the curved portion of each lift 10 and in the concave recess 10a thereof.

[0024] During operation, as the drum 20 rotates forwardly and reversely, the laundry is pulled up by the lifts 10 and then falls in a drop zone in the interior of the drum 20, to perform a mechanical washing process. Since the portion of each of the lifts 10 near the rotational shaft 70 is curved, the laundry can be lifted higher to fall, whereby a washing power is improved. As the laundry is caught and lifted upward by the lifts 10, the concave recess 10a enables a reduction in washing time, by pulling up more of the washing water and thereby soaking the laundry more thoroughly.

[0025] Moreover, the overall curved configuration of the lifts 10 differs with respect to the rotating direction of the drum 20. Thus, the drop zone of the laundry is varied as the drum 20 reverses its rotational direction. This variation enables a more thorough stirring action of the laundry and improves the washing power accordingly.

[0026] Meanwhile, contrasting moments are applied to the rotational shaft 70 during operation, which are especially significant with larger loads. That is, a relatively great moment is applied to the rotational shaft 70 by an eccentric

weight of laundry disposed at the far end of the drum 20 with respect to the rotational shaft 70, while a relatively small moment is applied to the rotational shaft 70 by an eccentric weight of laundry disposed at the near end of the drum.

[0027] Hence, since each of the lifts 10 has the curved portion near the rotational shaft 70 so that the laundry is distributed near the rotational shaft 70 on a dewatering step, the moment applied to the rotational shaft 70 by the eccentric weight of the laundry is decreased to reduce the vibration and noise.

[0028] FIG. 5 illustrates another drum-type washing machine according to the present invention, wherein the lifts according to FIG. 4 are mounted in an alternative configuration. Here, the lifts 10 are installed so that the curved portions of adjacent lifts face each other, i.e., symmetrically. In this manner, the washing action of the laundry is uniform regardless of the rotational direction of the drum 20.

[0029] Referring to FIG. 6, illustrating a lift 110 according to a second embodiment of the present invention, a concave recess 110a is formed on both sides of each lift. Thus, regardless of the drum's rotational direction, as the laundry is caught and lifted upward by the lifts 110, the concave recesses 110a enable a reduction in washing time by pulling up more of the washing water and thereby soaking the laundry more thoroughly, as in the

case of the concave recess 10a formed on one side only. Moreover, as with the lift configuration of FIG. 5, the lifts 110 according to the second embodiment may likewise be configured so that the curved portions of adjacent lifts 110 face each other, to provide uniform washing power regardless of the rotational direction of the drum 20.

[0030] By adopting a drum-type washing machine according to the present invention, several benefits arise, particular with respect to the curved portion of the lift. That is, with the curved portion of each lift disposed near the rotational shaft, washing performance is improved since the laundry is lifted higher to fall farther. Furthermore, the disposition of the curved portion inherently distributes the laundry closer to the rotational shaft on dewatering, so that the moment applied to the rotational shaft by the eccentric weight of the laundry is decreased to reduce vibration and noise. The curved portions also enable the drop zone of the laundry to vary according to the rotational direction of the drum, to produce a more thorough stirring action in the laundry, whereby washing power is improved.

[0031] In addition, the concave recesses of the lifts enable more washing water to be pulled up for soaking the laundry more thoroughly, to reduce washing time accordingly.

[0032] It will be apparent to those skilled in the art that various modifications and variations can be made in the present

invention. Thus, it is intended that the present invention covers such modifications and variations, provided they come within the scope of the appended claims and their equivalents.